

To spend or mend



A crane's useful life may be extended by increasing its height

With capex under increased scrutiny, is equipment refurbishment a cost-effective means for terminals to stay ahead of the game? asks **Benedict Young**

Manufacturers of cargo handling equipment have been particularly badly hit by the fallout from the global economic crisis, with order intake down by 50% or more in many cases. But while terminal operators are keen to minimise capital expenditure, they still require effective equipment to service cargo volumes. Consequently, refurbishment of older equipment may be a viable solution to bridge the gap.

"Due to the economic recession, customers often do not have a budget to buy new equipment," says Peter Klein, marketing manager of Gottwald Port Technology. "However, terminal operators have to handle vessels reliably and fast. Refurbishment is increasingly taken into account to improve the performance of equipment.

"Gottwald offers a remarkable range of solutions – including upgrades for controls, diesel engines or complete power packs, to name just a few – to maintain the availability of Gottwald equipment."

Whether it is worth refurbishing older

equipment rather than buying new will depend on the situation of the particular operation. Terminals should weigh up the benefits provided by new equipment – which may include reduced fuel consumption and higher handling rates – compared with the cost saving and the ultimate performance that will be available from a refurbished machine.

"It is a simple net present value calculation," says Mark Williamson, senior VP services for the EMEA region at Cargotec. "What are you going to get for your investment? Many customers are now seeing, in this present climate, that a shrewd modification project is far more cost-effective and much more cash-efficient."

Although refurbishment costs less than buying new, even such lower-level expenditure is under increased scrutiny.

"When the economic crisis first struck, there was a knee-jerk reaction from some terminal operators to suspend all capital spending and outflow of cash," says Larry Lam, chairman of Portek – which provides port equipment, services and solutions, as

well as operating medium-sized container and multipurpose ports.

"After the initial shock, however, they are returning to normality and are now continuing with the budgeted spending on refurbishment, etc. In the mid to long term, terminal operators will be inclined to upgrade and refurbish their equipment rather than buying new, especially in view of the increased cost of new equipment. A new post-panamax quay crane now costs in the region of US\$9m-9.5m, whereas an RTG is easily \$1.6m-2m each."

As the price differential between refurbishment of existing equipment and buying new has widened, it may well be advantageous, for instance, to spend \$2.5m for a drive change, a height increase and some general refurbishment, compared to \$9m-plus for a new crane.

"Many terminal operators still have their fleet of panamax quay cranes, which may be under-utilised due to the arrival of new, faster post-panamax cranes," says Lam. "Now is the time to get the refurbishment and up-rating of such cranes going, in view of the slower business faced by the terminals."

While the steel structure of a well-maintained quayside gantry crane may have a viable working life in excess of 30 years, many of its major systems and components will need replacing or renewing in little more than 10 years.

Drive control systems, for instance, have an economic life of around 10-15 years, not least because manufacturers continue to improve their technology.

Lam explains: "After 10-15 years, changing technology and diminishing spare parts support makes the overall performance of the drive less than satisfactory to the user in comparison to what is available with new equipment. Less availability means less revenue and higher operating costs.

"In refurbishing crane drive and controls, terminal operators should select mainstream manufacturers who are likely to remain in the business for the next 20 years, so as to ensure spare part and service support for the foreseeable life of the crane."

Today, energy-efficient technology can be also incorporated into new drives and controls. For RTG cranes, energy saving and storage systems are available that promise up

to 60% reduction in diesel fuel usage.

A reduction in energy consumption may also be facilitated by replacing Hydraulic-driven and hydrodynamic cable reels with fully electric inverter-driven units, points out Lam.

"Festoon rails should be checked for wear and replaced if overly worn. Where appropriate, cable chains could be used to replace the more cumbersome festoon cable system," he adds.

On the crane trolley, wheel alignment and the clearance between wheels and rails should be checked from time to time to identify the extent of wear and tear and whether they need replacing.

"The level between the boom/girder is critical to ensure that the trolley will not experience a sudden jerk or bump when crossing the joints," says Lam. "Some experiments show that the forces on the trolley structure are 10 times greater than normal when the trolley passes through an uneven joint, compared to a levelled joint. These forces are detrimental to the structure of the trolley including the operator cabin and the trolley supports."

Quay crane spreaders are renowned as the element container operations that face the harshest treatment and they are thought to contribute to up to half of crane breakdown stoppages.

"Spreader structures and components are subject to great shock loading in every cycle of the crane operation, particularly when crane speeds and heights are increasing significantly," explains Lam.

"Structural fatigue cracks – both visible from outside and non-visible internal cracks – are common occurrences [in spreaders]. Such cracks should be repaired with proper methodology, instead of just simple patchwork."

Crane refurbishment and spreader upgrades may provide a terminal with a good opportunity to ensure that spreaders are interchangeable between cranes.

Lam explains: "Most terminals have cranes of different brands and specifications which were acquired over a period of years. Such cranes normally come with different headblocks and spreaders that are often not interchangeable. When it is time to replace spreaders, it is possible, at a rather modest cost, to modify the headblocks and spreaders so as to enable any of the spreaders to be used on any one of those cranes."

Selecting a replacement spreader also offers the chance to change from conventional hydraulic spreaders to electric units, thus reducing energy consumption,



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noise, maintenance and pollution.

The assumed lifespan of a quay crane's steel structure is sometimes viewed as the reason to replace it. Indeed, the maximum depreciation or amortisation period is often pegged at little more than 20 years.

Lam argues: "The structural life of a container crane is easily in excess of 30 years, and could be 40 or more years if the crane structures had been properly designed, maintained and protected against corrosion. Fatigue cracks, however, do occur along the way as the crane ages. In most cases, such fatigue cracks could be made good with proper failure analysis and repair method."

There are cases of cranes of a 1960s vintage still operating, having been well-built in the first place as well as being properly maintained and appropriately refurbished. Anecdotal evidence suggests that some older cranes were built to last better than their modern counterparts.

Lam recommends visual inspection of critical areas of a crane once every six months, allowing the terminal operator to identify and repair any design defects or fatigue failures.

"Visual inspection and non-destructive tests (NDT) on critical areas should be done on cranes once in every two years," he adds. "This is to arrest any premature failures and rectify them immediately. Total comprehensive survey – which includes visual inspection, NDT and internal structural inspection – has to be done once in five years to prevent the set-in of any

unusual interior corrosion and water ingress."

Smaller cranes that may be coming to the end of their useful life due to the emergence of bigger ships can also get a new lease of life through height increases and, less frequently, boom extensions.

The complexity of such work will vary. For instance a four-metre boom extension may be quite simple but it may become uneconomical to go longer as hoist drums and the hoist gears may also have to be replaced.

While increasing crane height by five or six metres is a relatively straightforward practice which should not affect the rigidity of the crane, boom extensions are more likely to leave residual stresses. Appropriate expertise must, therefore, be sought by any operator considering such a course. Indeed, for any form of refurbishment, modification or retrofitting, selecting appropriate companies to plan and undertake the work is crucial.

"The same issues apply whatever the equipment," says Williamson. "Are you dealing with a professional organisation? Are they using OEM parts? Are they going to deliver on time? Can you trust them?"

Refurbishment and maintenance services are becoming a mainstream part of many equipment manufacturers' businesses and there are also various established specialist engineering firms offering solutions to the port sector. As such, there is no shortage of firms willing to offer refurbishment services, and now could be an ideal time to make that choice. **cs**